

# The CoastWatch Utilities



Peter Hollemans, Terrenus Earth Sciences for NOAA  
[Coast|Ocean|Polar] Watch Annual Meeting, Santa Cruz, Jul/Aug 2017

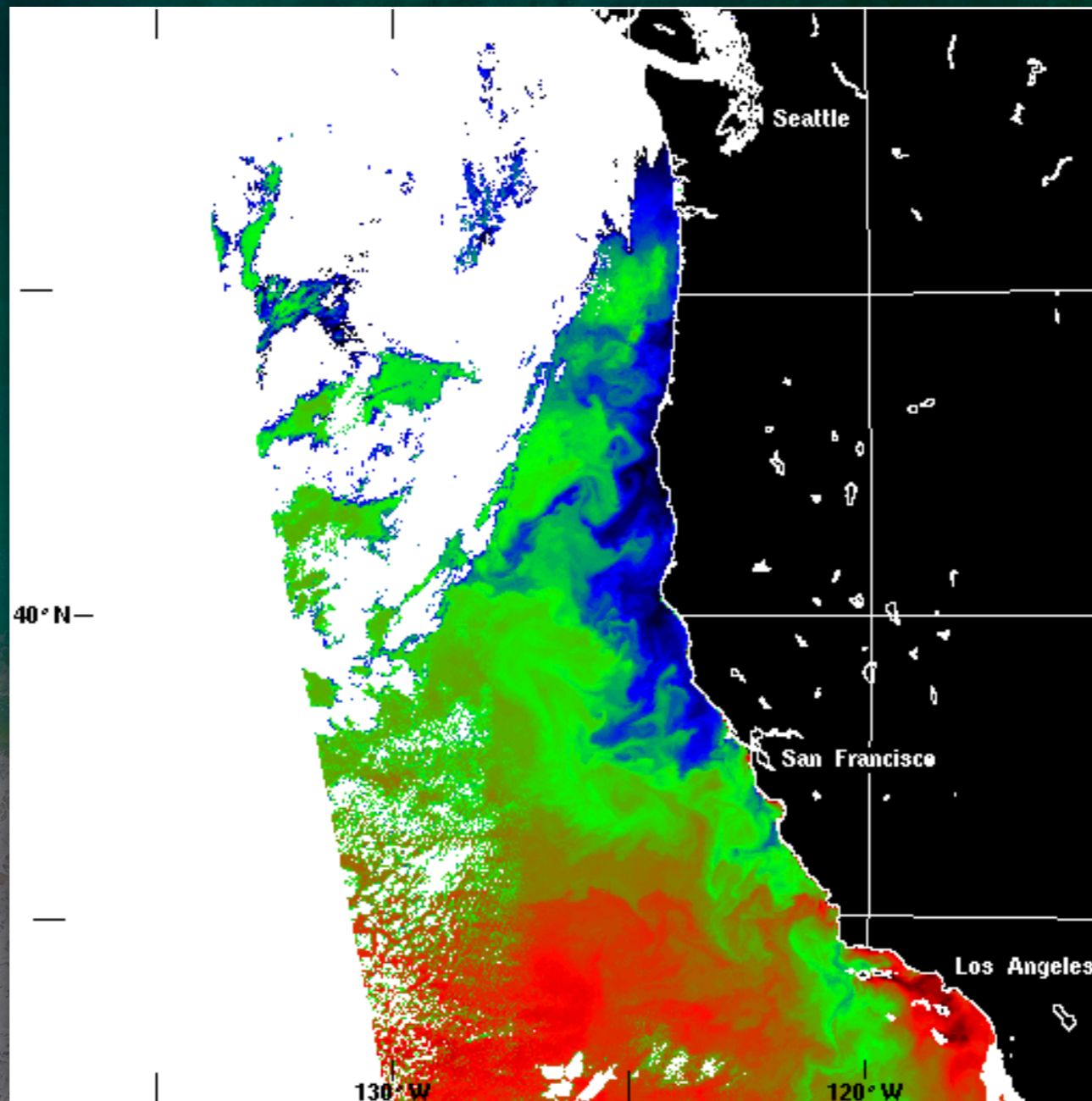
# Outline

- Historical Perspective
- Development & Functionality
- Download & Usage
- Latest & Future Updates

An aerial photograph of ocean waves breaking, showing white foam and turquoise water. The image is overlaid with a semi-transparent teal color. In the center, there is a rounded rectangular box containing the title text.

# Historical Perspective

# AVHRR SST



# Distribution

web.archive.org/web/19961207164722/http://cwatchwc.ucsi

NOAA/NESDIS CoastWatch Program, West Coast Regional Node

CoastWatch West Coast Regional Node

## West Coast Regional Node

### General Information

- [West Coast](#) Regional CoastWatch Node Information.
- Real world [applications](#) of CoastWatch imagery.
- CoastWatch [literature](#).

### What's New!

### Sample Products

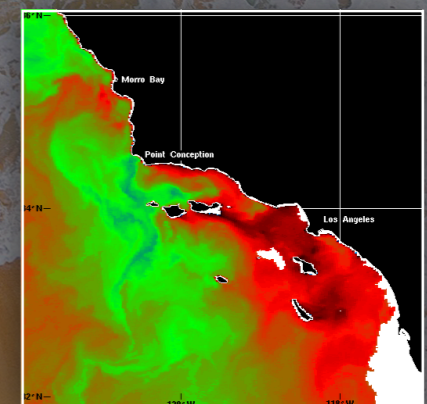
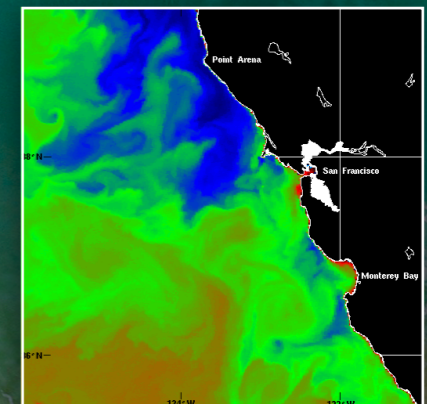
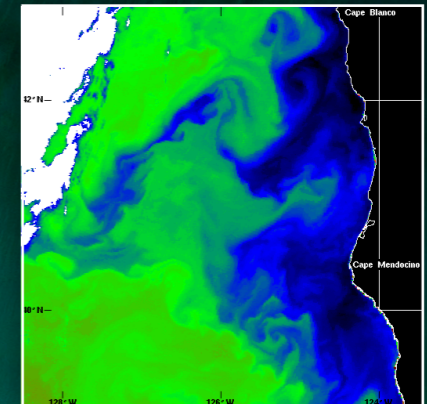
### Satellite Image Products: (restricted to registered users)

- **NOAA AVHRR**
  - [Notice](#), read before downloading binary files!
  - [Browse](#) and download images acquired in the past five days.
  - [Select](#) and/or preview images by product type and region.

### West Coast El Nino Watch Advisories

- [Latest](#) issue.
- [Archive and Background](#) information.

### Software



# Registration

## APPLICATION PROVISIONS

Through signature below, the Applicant agrees:

1. that NOAA is under no legal or financial obligations to provide any product to the Applicant;
2. to hold and save the U.S. Government, its officers, agents, and employees harmless from liability of any nature or kind, including costs and expenses, for, or on account of, any or all suits or damages of any character whatsoever resulting from injuries or damages sustained by any person or persons or property by virtue of negligence on the part of the Applicant, its officers, agent, and employees in the performance of this arrangement;
3. that products provided through this application are for:
  - a) the exclusive use of the Applicant in cooperative research with NOAA, or

to use the data and information, and any derived products, only for research, education, and other non-commercial purposes.

person or organization except for the Applicant's employees and affiliates, for purposes directly related to the Applicant's activities as described in sec. 3.b.;

5. to ensure, to the maximum extent practicable, that individuals and organizations which have access to CoastWatch data, information, and derived products are aware of and observe the limitations on use and redistribution contained in this application;
6. to keep a record of all recipients of CoastWatch data and information;
7. to provide CoastWatch data and information at no more than the cost of reproduction and transmission;
8. to be solely responsible for the procurement, installation, service, maintenance, and removal, at no cost to NOAA, of all telecommunication lines and equipment required by the Applicant to interface with the CoastWatch Regional Site. The Applicant shall be solely responsible for routine maintenance of equipment on loan from NOAA;
9. to give full credit and identification of any products

## APPLICATION FOR ACCESS TO COASTWATCH PRODUCTS FOR NON-COMMERCIAL USE

Application # \_\_\_\_\_

The NOAA CoastWatch Program maintains a national capability to provide a rapid supply of up-to-date, coordinated, near-real time data products to support Federal and state decision makers and researchers responsible for managing the Nation's living marine resources and ecosystems. The Program provides time-critical "decision support" in response to rapidly emerging coastal environmental situations. The NOAA CoastWatch West Coast Node houses the West Coast Regional Site of the CoastWatch Program and serves as the delivery point for all products from the CoastWatch Program.

The NOAA CoastWatch West Coast Node provides all CoastWatch products via access to the NOAA Regional Site located at NOAA/NMFS Southwest Fisheries Science Center, 2215 Rutherford Way, Santa Cruz, CA 95060. NOAA CoastWatch West Coast Node makes no representation as to the schedule and contents of the products of the Applicant, although the schedule of products may be changed without notice. NOAA announces these changes at least 30 days in advance whenever possible.

This arrangement becomes effective upon signature, and shall remain in effect until terminated by NOAA or the Applicant with 30 days' written notice. The Applicant may terminate this arrangement upon providing 30 days' written notice to NOAA.

NOAA may terminate this arrangement after 30 days' written notice to the Applicant, if NOAA determines that:

- (1) such termination is in NOAA's best interests, or
- (2) technological difficulties result from the access provided for in this agreement.

NOAA may terminate this arrangement immediately if NOAA determines that:

- (1) the Applicant has violated any provision of this arrangement, or
- (2) the Applicant has failed to ensure that a recipient of the products furnished by the Applicant has complied with such provisions.

This arrangement shall be reviewed annually and may be amended as NOAA deems necessary. This arrangement supersedes all previous arrangements for the provision of CoastWatch data and products.

that are furnished by the NOAA CoastWatch West Coast Node and to avoid implication that any value-added products derived by it are attributable to NOAA or any element of NOAA;

10. to provide NOAA CoastWatch West Coast Node with an annual written report describing projects which used products delivered over the network and describing how these products were used. The Applicant will provide the annual written report in May of each year subsequent to the signature of this application. Samples of the products will be furnished as appropriate or as requested by the NOAA CoastWatch West Coast Node;
11. that the Applicant has no permanent or exclusive right to receive CoastWatch data and information, and that CoastWatch data and information may be modified or suspended at the discretion of NOAA, without recourse.

PRINT) \_\_\_\_\_

ADDRESS \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

PHONE # ( \_\_\_\_\_ ) \_\_\_\_\_

EMAIL ADDRESS \_\_\_\_\_

RESEARCH / DATA APPLICATION \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

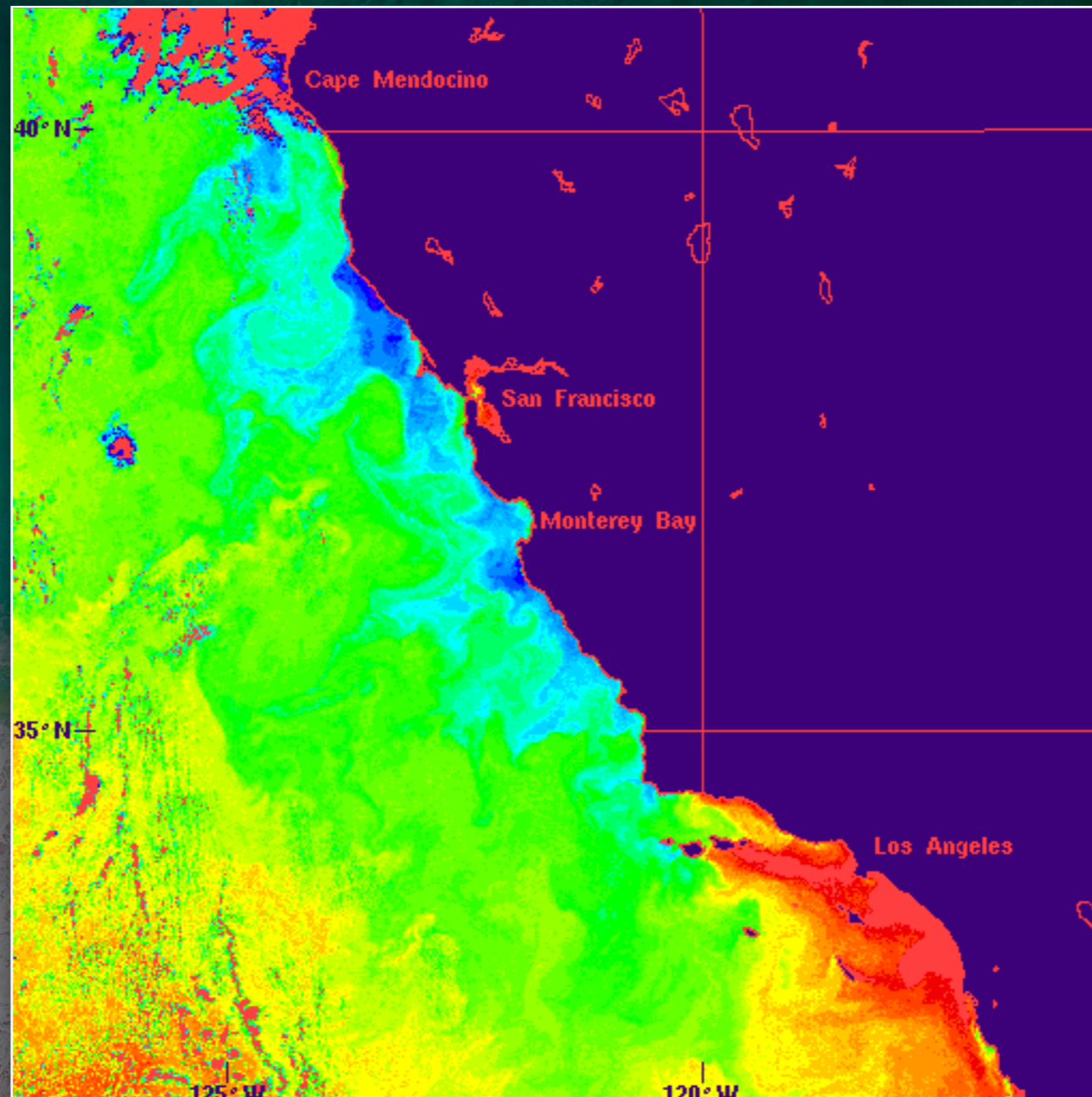
\_\_\_\_\_

\_\_\_\_\_

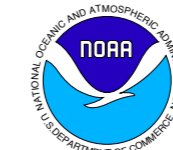
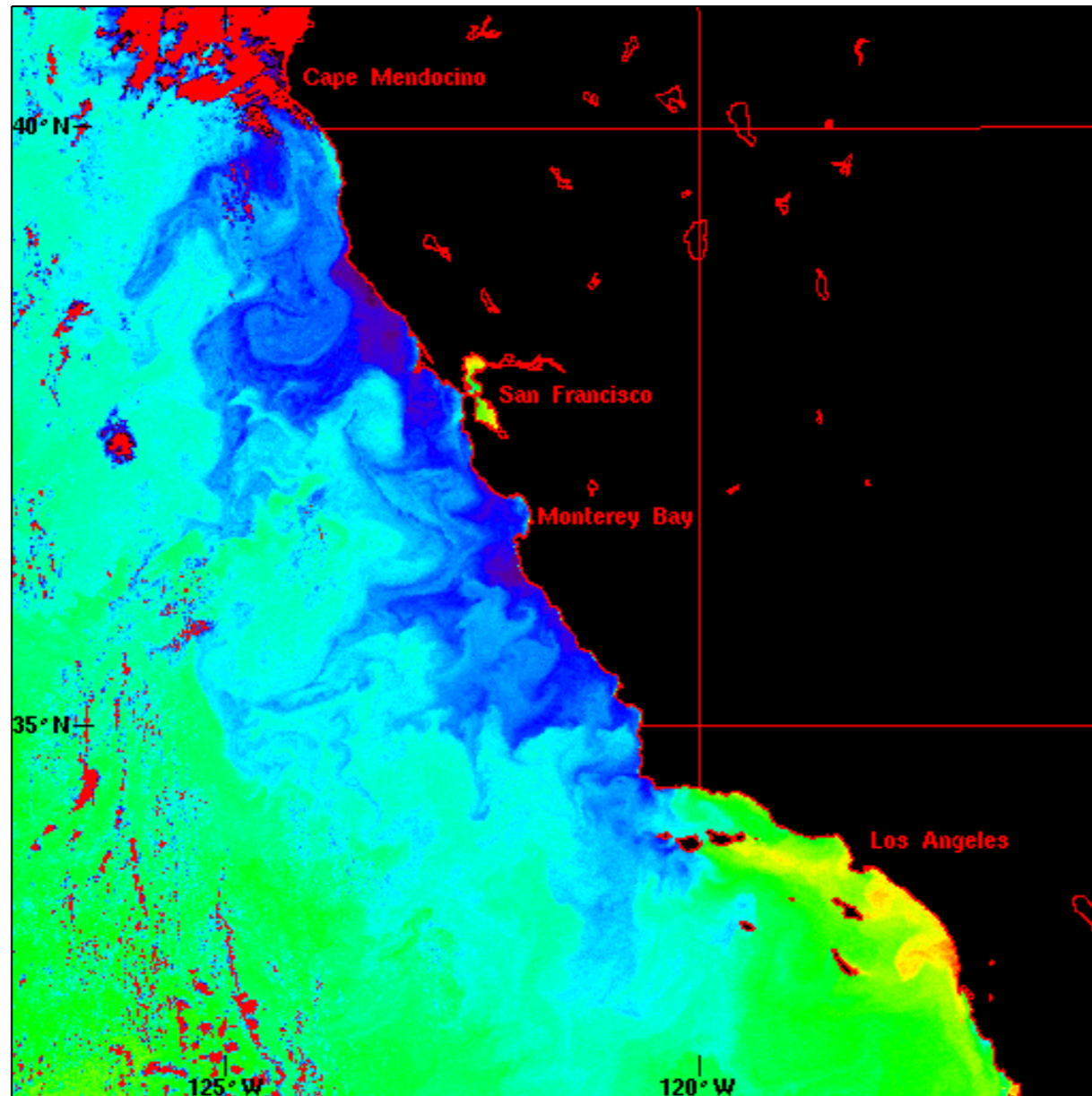
APPLICANT'S SIGNATURE \_\_\_\_\_

DATE \_\_\_\_\_

# DECCON (1993)



# CWIPS (1994)

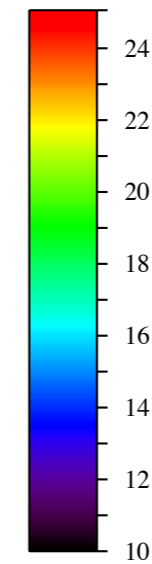


## CoastWatch

### AVHRR Temperature

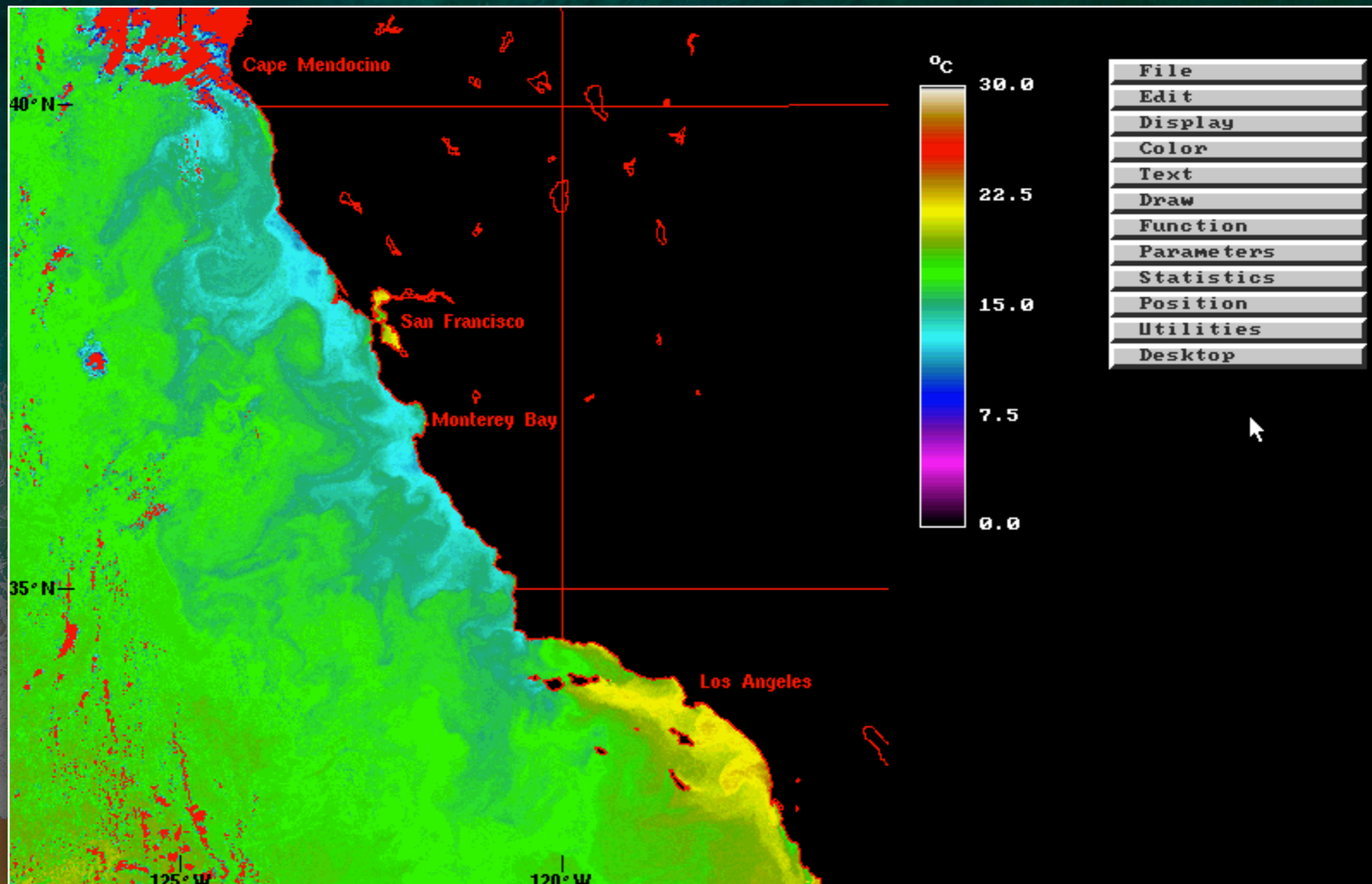
Filename: W9718221.SD7  
IMGMAP Image  
NOAA 14 Orbit: 0  
7/01/97 JD 182 21:58 GMT  
Pixel Size: 2.38 km  
Lat Range: 31.73N to 40.97N  
Lon Range: 127.23W to 115.74W  
Horiz. Offset: -5659 0  
Vert. Offset: 8554 0  
SST - Split Window

### Surface Temperature (Degrees Centigrade)





# CCoast (1994)



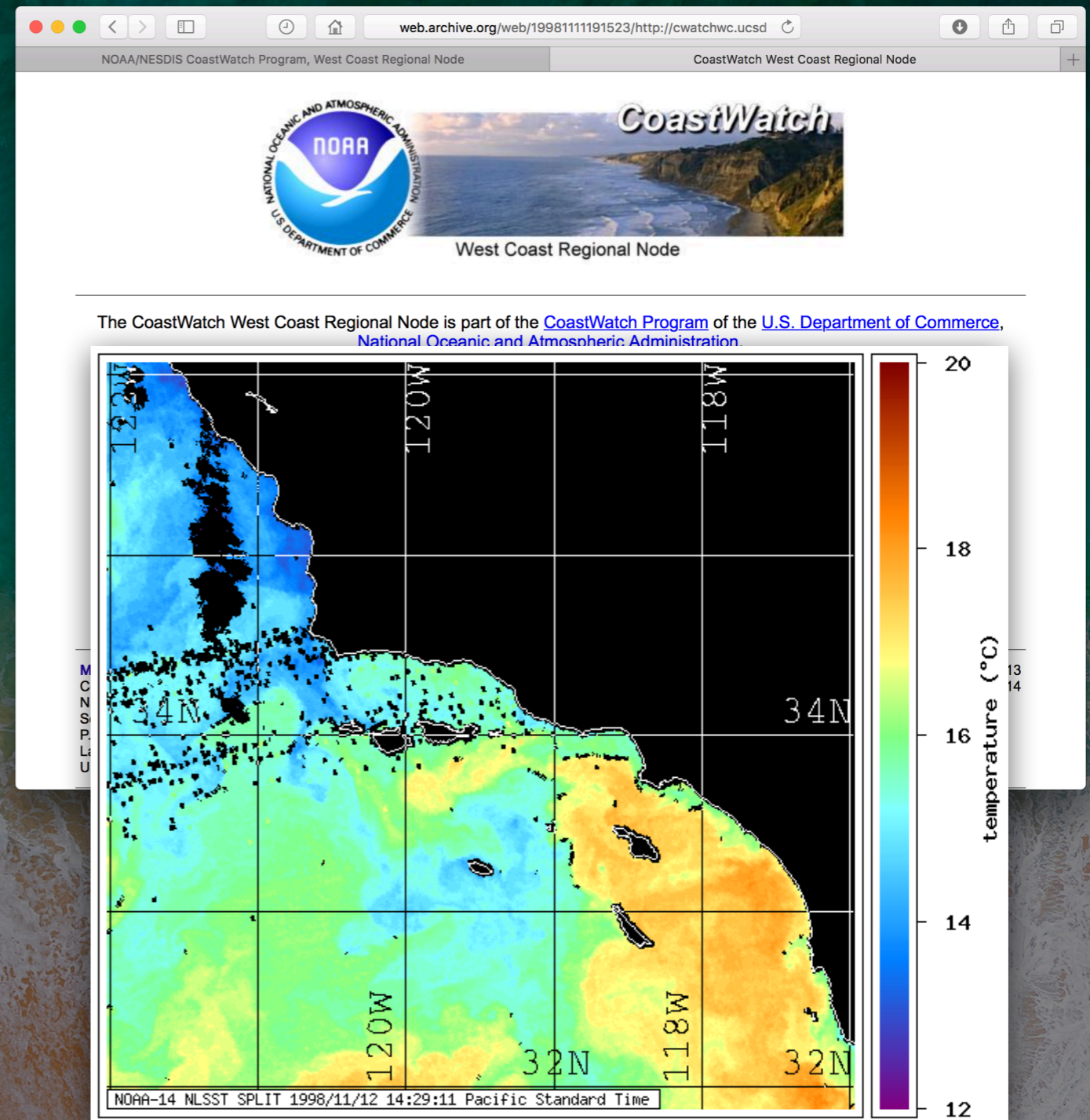
# Trends

- Number of products available
- Distribution software
- Permitted data usage
- Level of user anonymity
- Analysis software

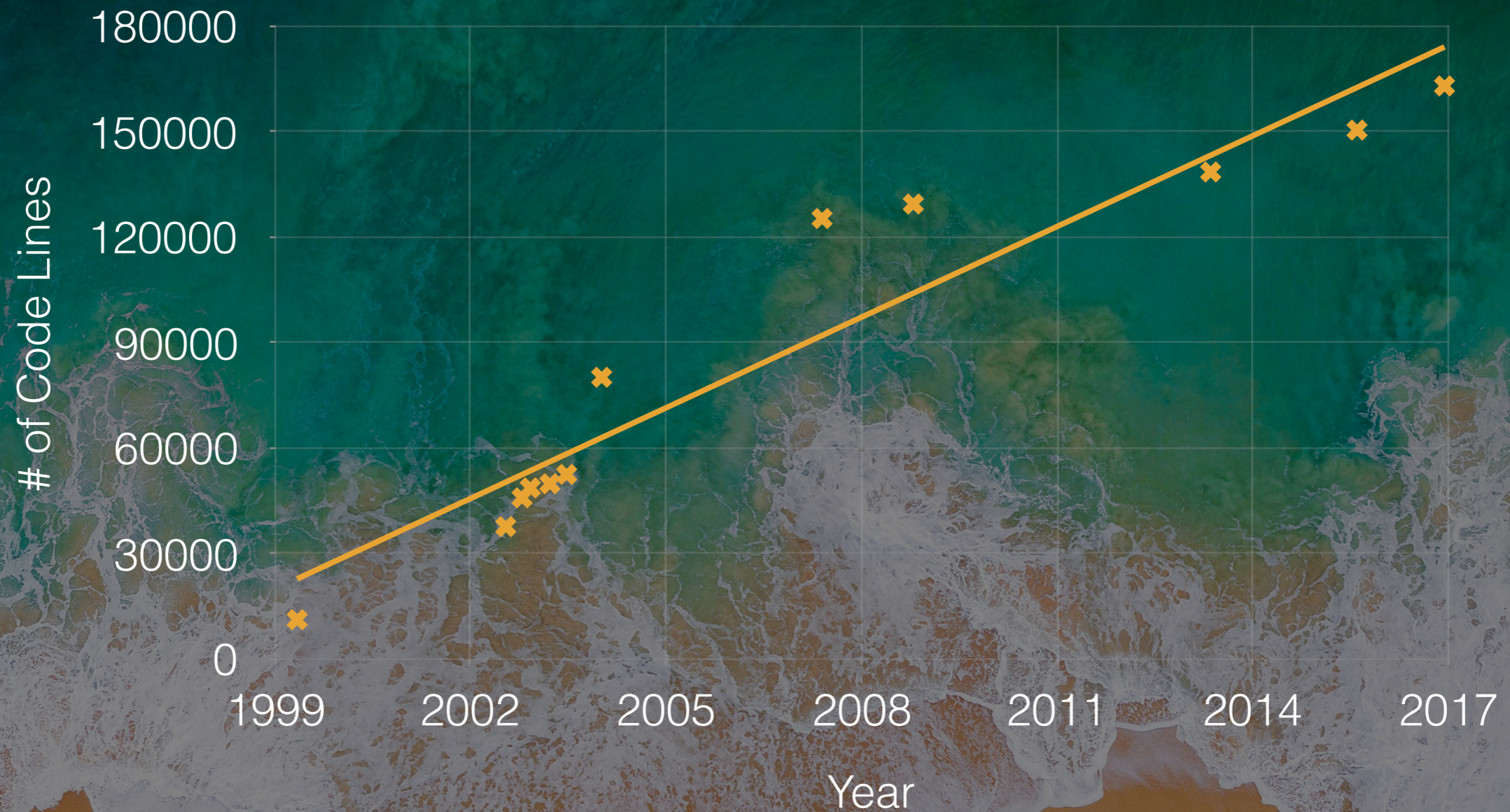
# Development & Functionality

# Initial Version

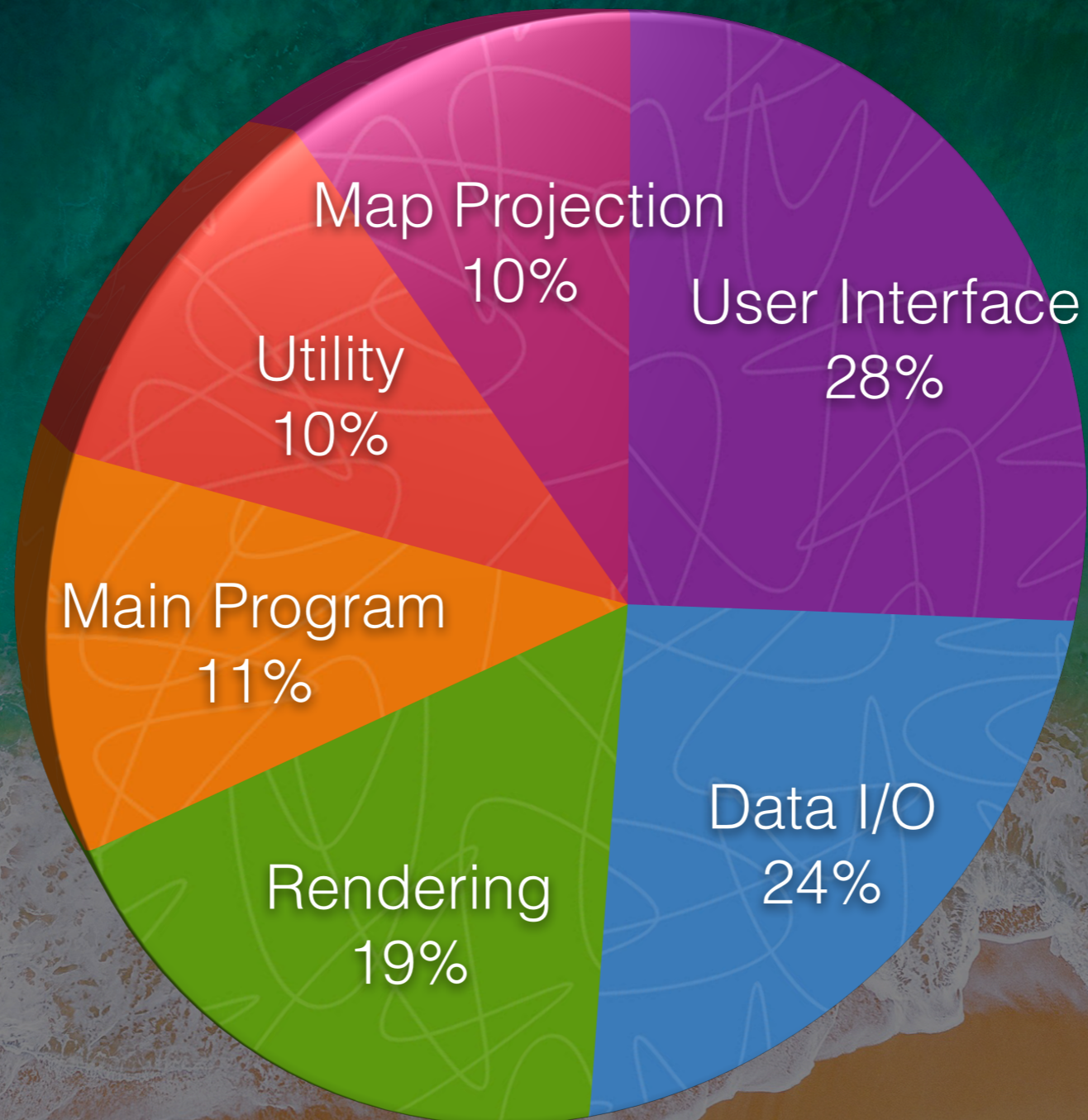
- West Coast node website scripts and product creation
- Product file read/write, render, conversion



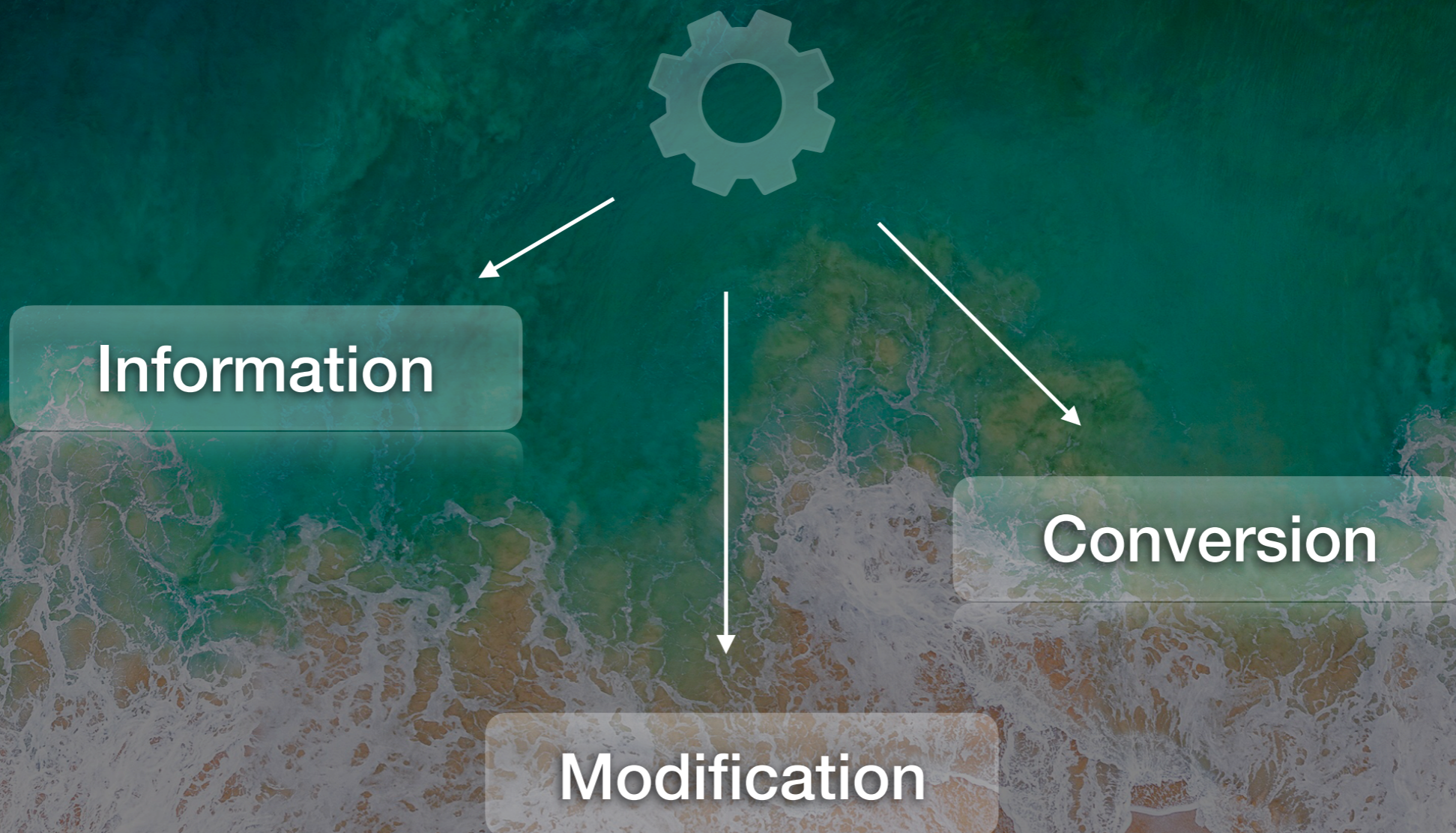
# Source Code Size



# Source Components



# Operations



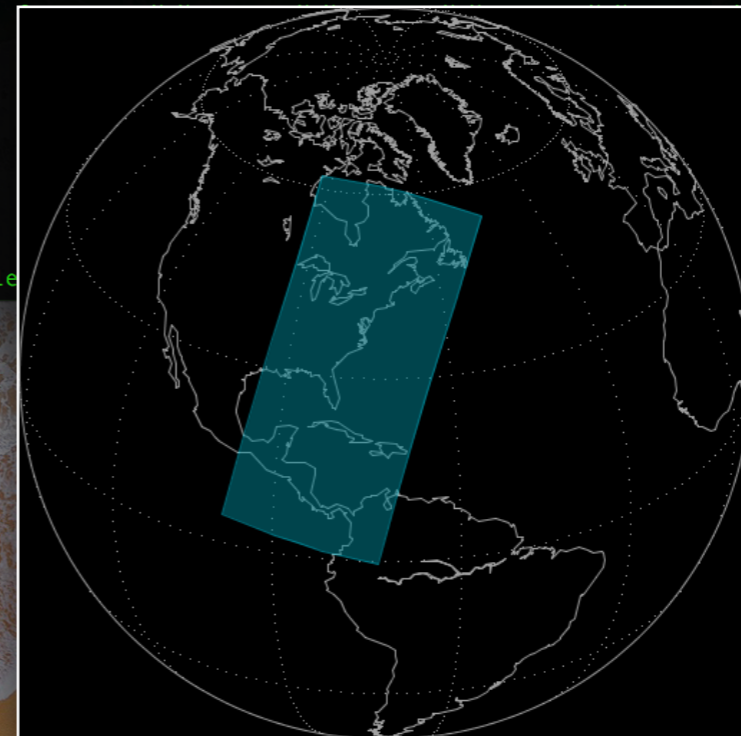
# Information

- File metadata summary
- Dataset statistics and sampling
- Geographic coverage maps

```
Sample Images -- -bash -- 94x24
Exex:Sample Images phollema$ cwinfo 2016_024_1456_m02_mi.hdf
Contents of file 2016_024_1456_m02_mi.hdf

Global information:
Satellite:      metop-2
Sensor:         avhrr
Date:           2016/01/24 JD 024
Time:           14:56:06 UTC
Scene time:     day/night
Projection type: swath
Origin:         USDOC/NOAA/NESDIS CoastWatch
```

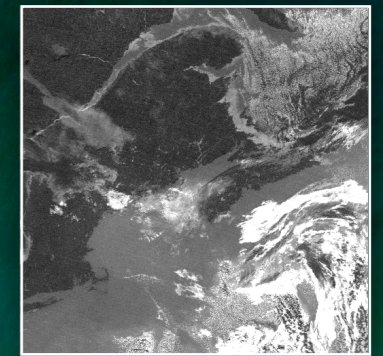
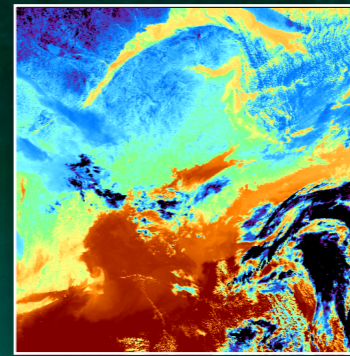
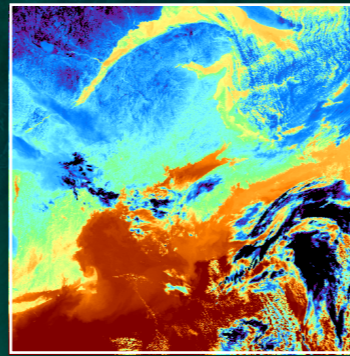
```
Sample Images -- -bash -- 94x24
rel_azimuth      short      6000x2048  degrees      0.01      0
sat_zenith       short      6000x2048  degrees      0.01      0
sst              short      6000x2048  celsius      0.01      0 scale      Offset
sun_zenith       short      6000x2048  degrees      0.01      0
swath_bounds     double     42596
Exex:Sample Images phollema$ cwstats --sample 0.01 2016_024_1456_m02_mi.hdf
Variable Count Valid Min Max Mean Stdev Median
swath_struct 14 ch1 14 short -101 108 -5.857143 69.481439 1.5
swath_bounds 426 ch2 426 short 0 5952.133 2986.628026 1728.605016 2999.5
swath_lat 480 ch3 480 short -1032.669 2033.858 6.873492 114.423444 -0
swath_lon 480 ch3a 480 short -8050.79 16628.578 28.824881 892.041327 -0
avhrr_ch1 123000 123000 0.65 84.59 14.489908 11.56327 10.52
avhrr_ch2 123000 123000 0.63 85.88 14.743629 11.234121 11.75
avhrr_ch3 123000
avhrr_ch3a 123000
avhrr_ch4 123000
avhrr_ch5 123000
cloud 123000
hrpt_header 6180
rel_azimuth 123000
sat_zenith 123000
sst 123000
sun_zenith 123000
Exex:Sample Images pholle
```



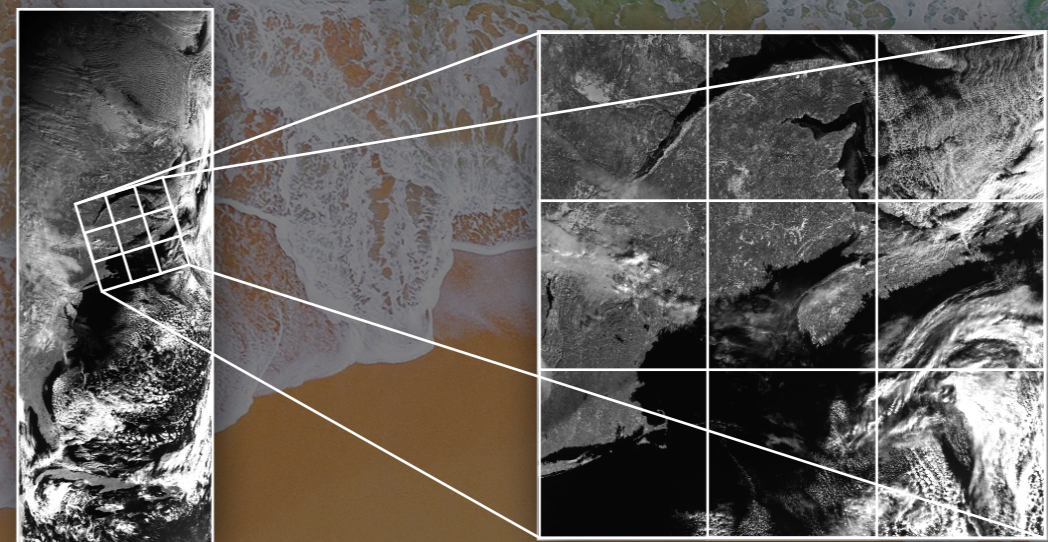


# Modification

- Generic math expressions
- Time series composition
- Angle computation
- Registration to map projections

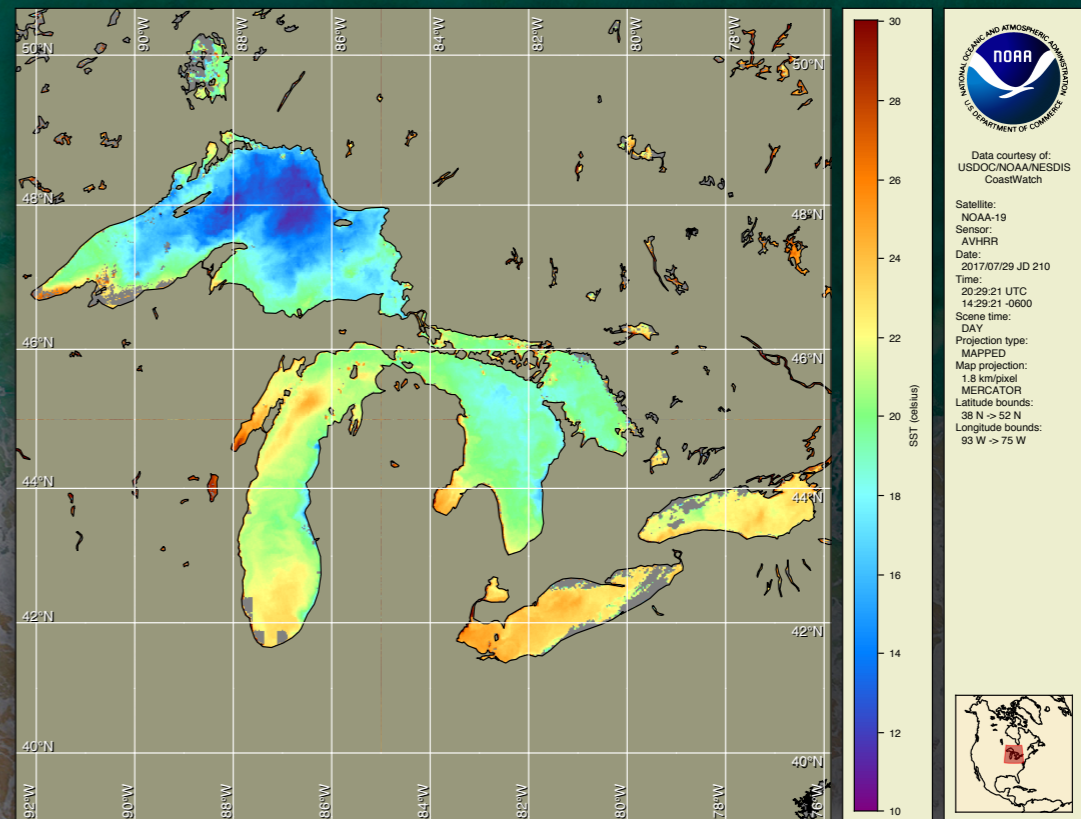


channel 4 - channel 5 = diff 45

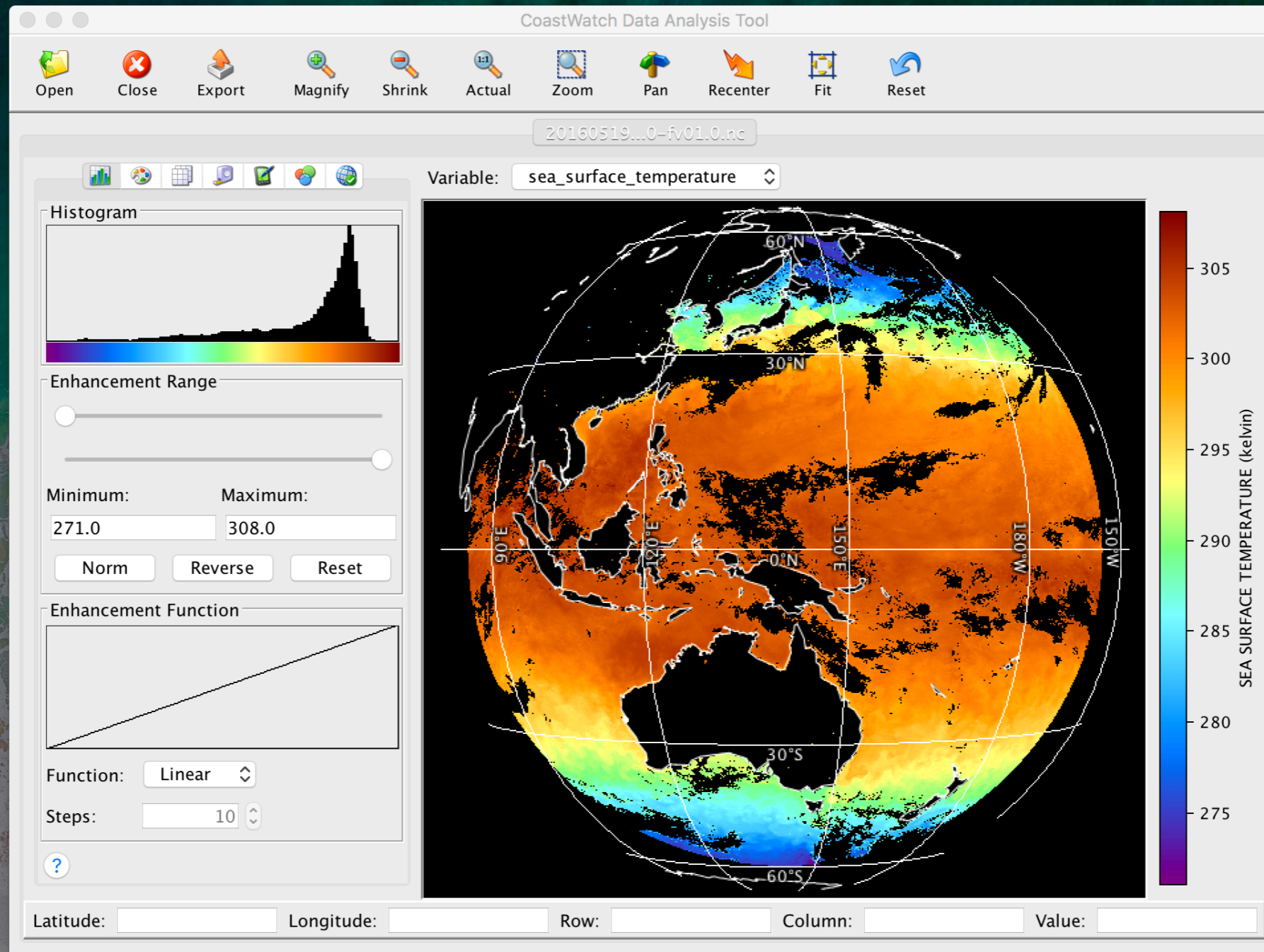


# Conversion

- Import to HDF
- Export to ArcGIS, binary, NetCDF, text
- Render to PNG, JPEG, GIF, GeoTIFF, PDF



# CoastWatch Data Analysis Tool



An aerial photograph of ocean waves with a teal color overlay. A semi-transparent rounded rectangle is centered on the image, containing the text 'Download & Usage'.

# Download & Usage

# Packages

- Download at [coastwatch.noaa.gov](http://coastwatch.noaa.gov)

- Versions:

- Linux



- Windows



- Mac



64-bit

- Version 3.3.1 (stable), beta versions

# Guides

- YouTube videos
- User's guide
- Unix manual pages
- Help menus



# Formats

- HDF & NetCDF
- Level 2: AVHRR, MODIS, VIIRS, Himawari
- Level 3: most map projections
- NOAA 1b HRPT, LAC, GAC
- GRIB
- OPeNDAP (not enabled)

# Users

- NESDIS: POES AVHRR image navigation quality
- ACSPO SST group: developing SST and cloud algorithms
- CoastWatch central operations: creating level 3 products, rendering, format conversion, chlorophyll data analysis
- CoastWatch data users: data product viewing, rendering, conversion



# Latest & Future Updates

# Latest Beta

- Improved NetCDF 3 & 4 reading
- New HDF libraries
- Statistics now run on polygon bounds
- GeoTIFF output handles UTM projections
- Bug fixes on request

# Point Features

The screenshot displays the CoastWatch Data Analysis Tool interface. The main window shows a map of the North Atlantic region with a sea surface temperature (SST) overlay. The variable is set to 'sst'. The map includes a grid with latitude and longitude coordinates. A dialog box titled 'Select the overlay properties' is open, showing 'Multi Point Overlay Properties'. The dialog has two tabs: 'Filters' and 'Features'. The 'Features' tab is active, showing the following settings:

- Feature Selection Rules:** If a feature matches all of the following conditions:
  - time within 30 minutes of 2017/06/04 15:00:00 UTC
  - quality\_level is equal to 5
- Grouping Rules:** Group features by platform\_id and select feature with time closest to 2017/06/04 15:00:00 UTC
- Symbols:** A list of symbols for different platform types, including Unknown, Ship, Drifter, T-Mooring, C-Mooring, Argo, HR-Drifter, and IMOS.

The dialog also includes an 'Auto-apply' checkbox and a 'Cancel' button.

# Suggestions

- Comparison of satellite with in-situ data
- Data processing within CDAT
- New NOAA vector coastline option

# Summary

- Historical Perspective
- Development & Functionality
- Download & Usage
- Latest & Future Updates

# Acknowledgements

- Funding: Alexander Ignatov, John Sapper, Paul DiGiacomo
- Testing: CoastWatch central operations & nodes